

engineering summer conferences

1977



07 HIGH SPEED COMPUTATION:
VECTOR PROCESSING

June 20-24, 1977

08 COMPUTER GRAPHICS APPLICATIONS

June 27-July 1, 1977

10 APPLIED NUMERICAL METHODS

June 27-July 1, 1977

THE UNIVERSITY OF MICHIGAN — COLLEGE OF ENGINEERING

Volume 2, Number 6, February 21, 1977

Ap 77

SHORT INTENSIVE COURSES FOR SUMMER, 1977

| Course Number | Title | Date | C.E.U.* |
|---------------|---|----------------|---------|
| 01 | Oxygen Steelmaking | May 16-20 | 4.0 |
| 02 | Minicomputer Interface Design: Examples from the Nova Computer | May 19-20 | 1.5 |
| 03 | Corrosion Engineering | June 15-17 | 2.0 |
| 04 | Improving Employee and Product Safety and Performance | June 16-17 | 1.5 |
| 05 | Fluid Cavitation | June 20-22 | 2.0 |
| 06 | Modern Engineering Approach to Production Planning and Scheduling | June 20-24 | 3.5 |
| 07 | High Speed Computation: Vector Processing | June 20-24 | 3.5 |
| 08 | Computer Graphics Applications | June 27-July 1 | 3.5 |
| 09 | Underground Storage of Gases | June 27-July 1 | 3.5 |
| 10 | Applied Numerical Methods | June 27-July 1 | 4.0 |
| 11 | Fluid Transients in Closed Conduit Systems | July 11-15 | 3.5 |
| 12 | Physiological Systems for Engineers | July 11-15 | 4.0 |
| 13 | Digital Communications in Spread- Spectrum, Data Bus, Optical Fiber, and Common-Carrier Systems | July 11-15 | 3.5 |
| 14 | Infrared Technology: Fundamentals and Systems Applications | July 11-15 | 3.5 |
| 15 | Advanced Infrared Technology | July 18-22 | 3.5 |
| 16 | Cost Containment in Hospitals | July 18-22 | 3.0 |
| 17 | Combustion Engine Emissions | July 18-22 | 3.5 |
| 18 | Logical Design for Digital Computer and Instrumentation Systems | July 18-22 | 4.0 |
| 19 | Database: Distributed, Systems, Models, Reorganization | July 18-22 | 3.5 |
| 20 | Database Design Methodology | July 25-29 | 3.5 |
| 21 | Mini and Microcomputers: Their Structures, Characteristics and Applications | July 25-29 | 4.0 |
| 22 | Semiconductor Electronics and Integrated Circuits | July 25-29 | 3.5 |
| 23 | Instrumentation for Mechanical Analysis | July 25-29 | 4.0 |
| 24 | Solar Energy for Heating and Cooling — Commercial and Residential | July 25-29 | 3.5 |
| 25 | Human Factors Engineering | August 1-12 | 8.0 |
| 26 | Electrochemical Engineering | August 1-5 | 3.5 |
| 27 | Coherent Optics | August 1-5 | 3.0 |
| 28 | Operations Research and the Management Sciences A: Methods and Tools | August 1-5 | 3.5 |
| 29 | Operations Research and the Management Sciences B: Recent Developments | August 8-12 | 3.5 |
| 30 | Noise Control in Engineering | August 8-12 | 4.0 |
| 31 | Design and Analysis of Engineering Experiments | August 8-19 | 6.5 |
| 32 | Continuous Casting | August 8-12 | 4.0 |
| 33 | Advanced Topics in Engine Emission Control | August 15-19 | 3.5 |
| 34 | Data Network Planning and Design | August 15-19 | 3.5 |
| 35 | Microwave Semiconductor Devices, Circuits, and Applications | August 15-19 | 4.0 |
| 36 | Simulation Using GPSS | August 15-19 | 4.0 |
| 37 | Written Communications for Engineers, Scientists, and Technical Writers | August 15-19 | 4.0 |

*Classroom contact hours divided by 10.

If you desire a catalog describing these courses, send your name and address to the address on the application or call (313) 764-8490.

ENGINEERING SUMMER CONFERENCES

Vol. 2 No. 6 February 21, 1977

Issued semimonthly in January, weekly in February, March and April. Second class postage paid at Ann Arbor, Michigan. Office of publication, Chrysler Center, North Campus, The University of Michigan, Ann Arbor, Michigan 48109.

POSTMASTER: Send Form 3579 to Engineering Summer Conferences, Chrysler Center, North Campus, The University of Michigan, Ann Arbor, Michigan 48109.

7707— HIGH-SPEED COMPUTATION: VECTOR PROCESSING

June 20-24 (3.5 C.E.U.)

Fee: \$375

Donald A. Calahan, Chairman

Vector (array) processors have recently moved from being research tools for computer scientists to become a significant advance in the state-of-the-art in high speed computation. With speeds 10-100 times that of the fastest "scalar" computers, these processors are already impacting many fields of large scale scientific simulation and engineering design. Moreover, this gap between scalar and vector computation speeds will inevitably widen as parallelism beyond the present 2-4 (arithmetic units)/processor is made possible by advances in integrated circuit technology.

A vector architecture — either parallel or pipeline — often necessitates significant algorithmic and software changes in scalar programs to achieve these speeds. In this course, the architectural, software, and algorithmic issues are coordinated by discussion of concepts in computer architecture, and by detailed study of current vector processors and their use. Special features of the course will include:

- 1) presentations on software/application issues by research personnel from sites owning vector machines;
- 2) remote access to two or more vector processors (the Texas Instruments' Advanced Scientific Computer (ASC), the Cray Research Cray-1, and/or the Control Data Corporation STAR 100).

PREREQUISITE

A bachelor's degree or equivalent background in mathematics, computer science, or engineering is a prerequisite; knowledge of Fortran is necessary for participation in the computational laboratory, and some assembly language experience is useful; general programming experience is useful but not necessary for the lectures.

INSTRUCTIONAL PROGRAM

Lectures will occupy about four hours per day; the remaining time will be spent in laboratory sessions. The latter will give participants an opportunity to gain experience in writing and executing programs on at least two vector processors and on the University's fast scalar processor — the Amdahl 470V/6 — for detailed and comparative study. Participants may bring small benchmark Fortran programs and these will be run as time permits.

COURSE CONTENT

Architectural/algorithmic issues — parallel and pipelined architectures and their mathematical modeling (vector startup, vector timing diagrams, infinite vs. finite vector

lengths); organization of algorithms in memory hierarchies; impact of data flow and memory addressing restrictions on algorithms.

Current processors — study of the architectures of the Texas Instruments ASC(1- and 4-pipe), the Cray-1, and the STAR 100; related software issues (assembly vs. Fortran coding, ANS vs. vector extensions, subroutine vs. macro-based scientific libraries); comparative study of the implementation of model problems on these processors, such as linear equation algorithms, integrators, sparse (direct) equation solvers, applications in fluid and plasma dynamics, structural analysis, circuit/device analysis; comparisons of analog/hybrid and digital/vector simulations.

Advances — modifications of current processors; next generation architectures; special-purpose vector processors; new applications.

STAFF

The chairman of the course and principal lecturer will be *Professor D. A. Calahan*; the computational laboratory will be operated by *Mr. D. A. Orbits*. Both instructors have been involved in developing algorithms for vector processors and in preparing benchmarks for the ASC, the Cray-1, and the STAR 100. Professor Calahan has written textbooks in computer-aided design and is preparing a manuscript on vector processing to be used in the conference. Further information can be obtained from (Calahan, telephone 313-763-0036 or Orbits 313-764-3324).

Visiting Lecturers:

Bill Buzbee, Los Alamos Scientific Laboratory
Jay Lambiotte, NASA/Langley Research Center

Presentations by Applied Dynamics Corporation, Burroughs Corporation, Control Data Corporation, and Cray Research, Inc.

REGISTRATION — Chrysler Center Lobby
8:30-9:00 a.m., June 20

7708— COMPUTER GRAPHICS APPLICATIONS

June 27-July 1

(3.5 C.E.U.)

Fee: \$375

Richard L. Phillips, Chairman

Computer graphics concerns the use of computers, digital plotters, high speed refresh type oscilloscope displays, and storage tube displays.

With computers and these devices one can display and interactively manipulate data describing objects and ideas formerly communicated by more traditional methods, such as engineering drawings and sketches. Computer graphics has already demonstrated tremendous potential in improving design methods in engineering, architecture, naval architecture, circuit component design, city and regional planning and plant design. In addition, applications are developing in real-time simulation of the visual images in aircraft landing simulation, medicine and the solution of complex mathematically-oriented applications.

This intensive course is intended for persons who have been exposed to traditional principles of graphical manipulations and seek to utilize computer graphics in their work. It is also intended for persons having previous computer experience who are now expected to apply that experience to engineering design and other fields where graphical presentation is a necessary component.

Provisions are made to accommodate these diverse, specialized backgrounds by providing lectures and workshops. In the lectures, participants will be introduced to the fundamentals of graphical display, methods for windowing, clipping and shading of figures representing charts or objects, and the fundamental aspects of display and plotter hardware. In addition lectures will provide a comprehensive view of computer applications.

In addition to lectures about one-fifth of the course time will be devoted to workshops where participants will receive personal attention to exploit their previous background and familiarize them with the new material covered in this course. All participants should acquire both a knowledge and appreciation of the skills of computer programming involved in the application of computer graphics.

PREREQUISITE

A Bachelor's degree is desirable. Some knowledge of FORTRAN is needed. Individuals who lack an engineering degree but who have considerable design experience are encouraged to contact the course chairman.

COURSE CONTENT

The course will familiarize attendees with computer graphics emphasizing general applications and using existing

graphical software tools. The important areas of two and three dimensional data presentation and the role of graphics in computer aided design will be given special attention. Moreover, interactive programming techniques will be stressed throughout the course. **All software tools used in the course will be made available to those enrolled.**

INSTRUCTIONAL PROGRAM

Lectures, workshops, and discussions will occupy most of the day. In addition, participants will be expected to work assigned problems. Course members will be free to consult with the lecturers about applications of computer graphics to their particular areas of interest.

Facilities include the University's Amdahl 470V/6 system and several storage tube display terminals. Also a Calcomp plotter will be available.

TOPIC OUTLINE

Introduction: Graphic display devices, libraries and graphics packages, graphics primitives, software standards and portability.

Interactive Display Terminals: Refresh storage tube, plasma panel, electric output storage tube, color devices, graphic input capabilities.

Display Programming Basics: Screen layout and management, absolute and relative vectors, windowing, clipping and shading, three dimensional operations.

Graphics in Data Presentation: Data graphing and display, labelling, data smoothing and curve fitting, contour and shading, three dimensional operations.

Graphics in Computer Aided Design: Man-machine dialog design, data models and information structures, retrieval and modification of data.

STAFF

From The University of Michigan:

Richard L. Phillips, Professor of Computer, Information and Control Engineering and Aerospace Engineering, Chairman of the course

David M. Yeager, Graduate Student in Computer, Information and Control Engineering

Visiting Lecturer:

Dr. James E. George, Assistant Group Leader, Computer Graphics Group, Computer Division, Los Alamos Scientific Laboratories, Los Alamos, NM

REGISTRATION — Chrysler Center Lobby
8:30-9:00 a.m., June 27

7710— APPLIED NUMERICAL METHODS

June 27-July 1

(4.0 C.E.U.)

Fee: \$375

Brice Carnahan and James O. Wilkes, Co-chairmen

This intensive course is intended for those persons in industry and elsewhere who wish to acquire a working knowledge of fundamental numerical methods. Emphasis will be placed on computer solutions to practical engineering problems. Participants will gain a basic understanding of the potential applications of digital computers and numerical methods in solving a wide variety of problems.

PREREQUISITE

Applicants should have a bachelor's degree in engineering or science. Some previous experience in writing FORTRAN programs is desirable, but not essential.

INSTRUCTIONAL PROGRAM

Lectures will occupy about four hours per day; the remainder of the time will be spent in laboratory sessions. The latter will allow participants to work selectively on two types of problems. First (assuming some experience in FORTRAN), to implement a few numerical techniques by writing programs for execution on the University's Amdahl 470V/6 computer. And, second, to run existing programs in order to compare the merits of various numerical methods for solving selected problems. Alternative assignments will be available for those with no previous programming experience. All participants will be encouraged to consult with the staff about possible applications of numerical and computing techniques to their particular fields. MTS (Michigan Terminal System) time-shared computing services will be available for use by the participants.

TOPICAL OUTLINE

Numerical Methods: Interpolating, Chebyshev, least-squares, and spline-function polynomial approximation of functions. Numerical integration using Newton-Cotes, Romberg, and Gauss-Legendre quadrature formulas. Solution of single algebraic and transcendental equations. Solution of simultaneous linear and nonlinear equations. Euler, Runge-Kutta, and multistep methods for the solution of ordinary differential equations; stability considerations. Explicit, implicit, and iterative methods for parabolic and elliptic partial differential equations. Introduction to the finite-element method.

REPRESENTATIVE PROBLEMS

Solution of equations of state. Radiant interchange between surfaces. Simultaneous chemical reactions. Deflection of loaded plates. Cooling-fin efficiency. Cast-metal solidification. Vapor/liquid equilibrium. Application of the

finite-element method. Simulation of a surge tank. General pumping and piping systems. Performance of a tubular reactor. Transients in an electrical network. Potential and boundary-layer flow. Spline-function approximation.

STAFF

The instructors will be *Professors Brice Carnahan and James O. Wilkes*, of the Department of Chemical Engineering, The University of Michigan. Both of these men have had extensive previous experience in teaching engineering faculty and engineers from industry and government, in similar programs. They are coauthors of several texts, including *Applied Numerical Methods* (Wiley, New York, 1969) and *Digital Computing and Numerical Methods* (Wiley, New York, 1973). Further information concerning the content of the course can be obtained by contacting either instructor (Carnahan: 313-764-3366, or Wilkes: 313-764-2383).

REGISTRATION — Chrysler Center Lobby
8:00-8:30 a.m., June 27



MAIN LOBBY OF THE CHRYSLER CENTER

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TRAVEL, HOUSING, AND PARKING

The following pages contain information useful to all persons planning to attend the Engineering Summer Conferences. Additional information on transportation and housing arrangements, including a detailed map and parking instructions, will be mailed to each applicant upon receipt of his application.

UNIVERSITY HOUSING

Accommodations are available in Baits Residence Halls located near the Chrysler Center on the North Campus, or in the Michigan Union and the Michigan League on the Central Campus.

Baits Hall is recommended for those who wish to stay within walking distance of the conference meeting rooms and who are interested in having the opportunity to meet informally with the other participants, since most of the attendees will be housed in this facility. Baits is a modern, comfortably furnished student dormitory with daily maid service. Each room is air-conditioned and has a semi-private bathroom which is shared with the adjacent room. Regular dining facilities in Baits Hall are not operated during the summer. The North Campus Commons which is adjacent to the Chrysler Center, will serve lunch only, during May and June, and breakfast and lunch during July and August. University dining facilities located on Central Campus and open to visitors are in the Michigan Union and the Michigan League. Many restaurants are located in surrounding areas. The room rates given in the list of housing facilities below do not include the cost of meals. The course enrollment form at the back of this brochure, page 78, provides a place to request a reservation in Baits by checking the appropriate housing box.

The Michigan Union and the Michigan League are student-alumni centers on the Central Campus which provide most hotel conveniences including twenty-four hour desk service, air-conditioned rooms, private bath, TV, telephone, and dining facilities. Transportation from bus stops on the Central Campus to the Chrysler Center on the North Campus, and other points, is available without charge on University buses. *Requests for additional information or for housing reservations in either the Union or the League should be sent directly to the appropriate address given below:*

Telephone (313)

Baits Hall 764-8490

1440 Hubbard, North Campus
Single \$11.25, Half a Double Room \$8.00
(Use course enrollment form for reservation.)

Michigan Union 662-4431

530 South State, Central Campus
Single \$15.00, Half a Double Room \$10.00
(Special Conference Rates on Request for May, June, July and August only)

Michigan League 764-3177

227 South Ingalls, Central Campus
Single \$20, Double Occupancy \$26

NOTE: Room rates are subject to change. Please verify charge before confirming reservation.

PREREGISTRATION

Applications should be submitted at least one month before the course starting date if possible, using the form provided on the last page of this booklet. Individuals who require additional time to obtain employer authorization may reserve space by submitting a completed application. A full refund of the course fee will be made in the event an application is either not accepted or is withdrawn before the course starting date. Applications will be acknowledged by mail and instructions for registration in Ann Arbor will be sent with notification of acceptance. Our telephone is (313) 764-8490.

PAYMENT OF FEE

The fee for each course is listed with the course description. Enrollment in Engineering Summer Conferences requires payment of fees or arrangement for payment before the conference begins. Please mail a check, purchase order, or government contract with your application if possible. Make checks payable to The University of Michigan, Engineering Summer Conferences, and designate the name(s) of applicant(s) on the check. If payment is not enclosed with your application, please instruct your purchasing representative or contracting officer to be certain that both your name and the title of the course in which you desire to enroll are clearly designated on a check, purchase order, or contract mailed separately. Requests for transfer of registration or for cancellation must be received before the starting date of the course.

Educational expenses such as enrollment fees, books, supplies, parking, and related travel and living costs may be deducted under certain conditions. Consult your local income tax agency for more detailed information.

NOTES AND CERTIFICATES

Each student will be given a bound copy of lecture notes at the beginning of the course. Textbooks which may be recommended for advance preparation or for supplemental reading are not included in the fee.

At the conclusion of each course, students are presented certificates attesting to their attendance and indicating the number of C.E. Units awarded. One Continuing Education Unit (C.E.U.) is awarded for each ten contact hours of classroom participation. A central record of C.E. Units earned is maintained.

FACILITIES

The Conferences will be held in the Chrysler Center for Continuing Engineering Education located on the North Campus. All classrooms are air-conditioned, carpeted, have comfortable chairs, good acoustics, and provision for the most modern audiovisual aids.

Return the completed application to:
ENGINEERING SUMMER CONFERENCES
400 Chrysler Center, North Campus
The University of Michigan
Ann Arbor, Michigan 48109

| | | | | | |
|----------------|-----------|---------|------|---|----|
| FOR OFFICE USE | Off/Dup | Housing | * | * | 07 |
| Course No. | Reg. Date | Paid | Sent | | 08 |
| | | | | | 10 |

- Name of Applicant: Last _____ First _____ (Initial) _____ (Social Security Number) _____
- Home Address: Number and Street _____ City _____ State _____ Zip Code _____
- Business Address: Name of Employer _____ Address _____ City _____ State _____ Zip Code _____
- Position or Title: _____ Business Phone: _____ Area Code _____ Number _____ Extension _____
- Highest Degree Attained: _____ Degree _____ College _____ Most Adv. Math _____ Course Name _____ Year _____
- Enroll me in _____ Course Name(s) _____ Date Begins _____ Ends _____
- FEE: ADVANCE PAYMENT OF COURSE FEE OR ARRANGEMENT FOR PAYMENT REQUIRED PRIOR TO REGISTRATION IN ANN ARBOR. MY FEE IS \$ _____.
☐ Check is enclosed (Payable to The University of Michigan)
☐ Check will be sent in time for registration.
☐ Purchase Order or Contract enclosed.
☐ Purchase Order will be sent in time for registration.
☐ Payment will be made at registration.
- HOUSING: FOR DORMITORY HOUSING CHECK BOXES. OFF-CAMPUS HOUSING INFORMATION SENT UPON RECEIPT OF APPLICATION.
☐ Reserve a single room in Baits Hall, apx. \$11.25 night.
☐ Reserve half a double in Baits, apx. \$8.00 night.
☐ Reserve a full double, apx. \$16.00 night.

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